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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/528,296	03/17/2000	Kazuhiko Takada	000294	4124
38834	7590	07/02/2004	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			NADAV, ORI	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 07/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/528,296

Applicant(s)

TAKADA, KAZUHIKO

Examiner

ori nadav

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 7-12 is/are pending in the application.
- 4a) Of the above claim(s) 8-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art (APA) in view of Cook et al. (6,022,791) and Chiang et al. (5,817,572).

Regarding claim 1, APA teaches in figure 2 and related text (pages 1-3) a substrate 21; and a multilayer interconnection structure formed on the substrate (page 1, lines 15-37), the multilayer interconnection structure including: at least first and second interlayer insulation films 24, 25 provided on the substrate; and a guard ring pattern 12 embedded in each of the first and second interlayer insulation films for blocking penetration of moisture, the guard ring pattern extending along a periphery of the substrate (figure 1B), the multilayer interconnection structure being planarized by using a CMP process (page 5, 11-17),

the guard ring pattern including: a groove 24A formed in each of the first and second interlayer insulation films, a conductive wall 24C filling the groove in each of the first and second interlayer insulation films 24, 25 and extending to a top principal surface thereof; and a conductive pattern 25A making a contact with a top part of the conductive wall 24C and having a principal surface coincident to the top principal surface of the interlayer

insulation film 24, the conductive wall 24C in the first interlayer insulation film 24 being offset with respect to the conductive wall 25C in the second interlayer insulation film 25 in a direction parallel to a principal surface of the substrate when viewed in a direction perpendicular to the principal surface of the substrate, wherein the interlayer insulation film comprises a first insulation film 24 that support the conductive wall 24C, the conductive pattern comprising Cu (page 4, line 28 to page 5, line 17), a bottom edge of the conductive wall 25C making an intimate contact with the top principle surface of the conductive pattern 25A, the conductive pattern and the second insulating film located at a top part of the multiplayer interconnection structure being covered continuously with an insulation film 26.

APA does not teach a guard ring pattern having a groove and a conductive wall comprising Cu and changing direction repeatedly and alternatively in a plane parallel to the substrate in one of a triangular wave pattern and a rectangular wave pattern, wherein the conductive wall extends from a bottom principal surface of the interlayer insulation film and a second insulation film that supports the conductive pattern laterally and having a coplanar top principle surface therewith.

Cook et al. teach in figures 5 and 8 and related text a guard ring pattern 60, 70, respectively having a groove and a conductive wall M0-M4 changing direction repeatedly and alternatively in a plane parallel to the substrate in one of a triangular wave pattern and a rectangular wave pattern (column 4, lines 7-13).

Regarding the claimed limitations of a conductive wall extending from a bottom principal surface of the interlayer insulation film and a second insulation film supporting the conductive pattern laterally laterally and having a coplanar top principle surface

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therewith, are not taught by APA, because APA does not form the conductive structure using etch stop layers. Chiang et al. teach in figure 25 and related text forming a conductive structure using etch stop layers. Chiang et al. teach a conductive layer 393, 394 (column 21, line 25) extends from a bottom principal surface of the interlayer insulation film 390, 391 to a top principal surface thereof, and a second insulation film 350, 323 that supports conductive pattern 360, 361 laterally, and having a coplanar top principle surface therewith.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a guard ring pattern having a groove and a conductive wall comprising Cu and changing direction repeatedly and alternatively in a plane parallel to the substrate in one of a triangular wave pattern and a rectangular wave pattern, as taught by Cook et al., and a conductive wall extends from a bottom principal surface of the interlayer insulation film to a top principal surface thereof, wherein the second insulation film supports the conductive pattern laterally and having a coplanar top principle surface therewith, as taught by Chiang et al., in APA's device in order to reduce stress and prevent cracks, to improve the problems of signal delay in the device, and in order to provide better control over the depth of the conductive wall and to avoid additional planarizing steps, respectively.

The combination is motivated by the teachings of Cook et al. who point out the advantages of using a guard ring pattern having a groove and a conductive wall changing direction repeatedly and alternatively in a plane parallel to the substrate in one of a triangular wave pattern and a rectangular wave pattern with respect to a guard ring pattern

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having a straight pattern (column 4, lines 14-24), and by the teachings of Chiang et al. who point out the advantages of forming a conductive wall extending from a bottom principal surface of the interlayer insulation film to a top principal surface thereof by using an etch stop layer in between the two interlayer insulation films (column 3, lines 21-35).

Note that although APA teaches a multilayer interconnection structure being planarized by using a CMP process (page 5, 11-17) this is a process limitation which would not carry patentable weight in this claim drawn to a structure, because distinct structure is not necessarily produced. "Product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that the applicant has the burden of proof in such cases, as the above case law makes clear.

Regarding claim 2, APA teaches in figure 1 a guard ring pattern extending continuously along the periphery of the substrate.

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Regarding claim 3, APA teaches in figure 1 a conductive pattern extending in the form of a straight line along peripheral edge of the substrate.

Regarding claim 4, the combination of Cook et al. and APA teach a conductive pattern changes a direction repeatedly and alternatively in the plane parallel in correspondence to the conductive wall.

Regarding claim 7 Chiang et al. teach in figure 25 an etch stop layer 390 interposed between the first and second insulation films. Therefore, the device of APA Chiang et al. teach an etch stop layer 390 interposed between the first and second insulation films, as claimed.

Response to Arguments

Applicant argues that there is no motivation to modify the APA'S guard ring structure by Cook et al., because Cook et al. explains that dicing semiconductor wafers was known to cause the problem of cracks propagating across chips but crack propogation was never a problem in APA's device.

Cook et al. teach a guard ring structure that is superior to that disclosed by APA and Cook et al.'s prior art. An artisan would be motivated to modify APA's device in view of Cook et al. in order to provide better protection for APA's device. Although APA does not disclose crack propogation as a problem, an artisan would be motivated to modify APA's structure with Cook et al.'s superior guard ring in order to prevent future

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possible crack propagation in case APA's device is used in an application which may require dicing. Furthermore, Cook et al. teach that the superior guard ring also provides protection from stress corrosion mechanisms caused by atmospheric moisture (column 1, lines 35-37). APA's structure is certainly subjected to atmospheric moisture which can degrade the quality of the device without the protection of Cook et al.'s guard ring. Moreover, it is unclear how semiconductor devices, which are manufactured on a semiconductor wafer, can be used in a practical application without dicing the semiconductor wafer.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

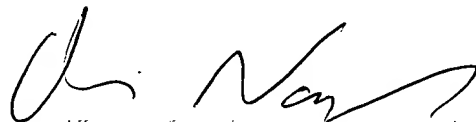
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is (571) 272-1660. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is 308-0956

A handwritten signature in black ink, appearing to read 'Ori Nadav', is positioned above the printed name and title.

O.N.
June 29, 2004

ORI NADAV
PATENT EXAMINER
TECHNOLOGY CENTER 2800